

**RESPONSE UNDER 37 C.F.R. § 1.116
EXPEDITED PROCEDURE
EXAMINING GROUP 2673**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named
Inventor : Goodman

Appln. No.: 09/823,585

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For : OUT-OF-VOCABULARY WORD
DETERMINATION AND USER INTERFACE
FOR TEXT UNITY VIA REDUCED
KEYPAD KEYS

Docket No.: M61.12-0380

Group Art Unit: 2673

Examiner:
David Lee Lewis

AMENDMENT AFTER FINAL

**VIA ELECTRONIC FILING SYSTEM
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Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

This is in response to the Office Action mailed on June 30, 2006. Please amend the above-identified application as follows.

AMENDMENT TO THE CLAIMS

1. (currently amended) A method for selecting an intended word entered using a reduced keypad, where each of one or more keys of the reduced keypad is mapped to a plurality of letters, the method comprising:

for an entered key input using a single-tap approach in which one of the keys is pressed only once for each letter, determining one or more sequences of letters as the intended word based on a score for each of the one or more sequences of letters; and presenting the one or more sequences of letters as the intended word, where a user selects the intended word from the one or more sequences of letters without resorting to a multiple-tap approach in which one of the keys is pressed at least once for each letter, and where the user can indicate without resorting to the multiple-tap approach an accepted one or more initial letters of the intended word from the one or more sequences of letter, the one or more initial letters having less letters than the intended word, to cause redetermination of the one or more sequences of letters presented as the intended word.

2. (original) The method of claim 1, wherein the reduced keypad is a numeric keypad.

3. (original) The method of claim 1, wherein the sequences of letters each corresponds to a word not listed in a predetermined dictionary.

4. (original) The method of claim 1, wherein the sequences of letters each corresponds to a pseudo-word.

5. (original) The method of claim 1, further comprising receiving selection of the intended word from the user from the one or more sequences of letters.

6. (original) The method of claim 1, further comprising:

receiving indication of a first letter of the intended word from the user; and
repeating the method such that the one or more sequences of letters are redetermined
taking into account the first letter of the intended word indicated by the user.

7. (original) The method of claim 6, further comprising:

receiving indication of a second letter of the intended word from the user; and
repeating the method such that the one or more sequences of letters are redetermined
taking into account the first and the second letters of the intended word indicated by
the user.

8. (original) The method of claim 1, wherein the user has accepted a number of letters of the intended word, the number equal to zero or more, and determining the one or more sequences of letters comprises determining the one or more sequences of letters consistent with the entered key input and the number of letters accepted by the user.

9. (original) The method of claim 8, wherein the one or more sequences of letters comprises a sequence of letters for each letter corresponding to a number within the entered key input immediately after a part of the entered key input corresponding to the number of letters accepted by the user.

10. (original) The method of claim 9, wherein the sequences of letter for each letter corresponding to the number within the entered key input immediately after the part of the entered key input corresponding to the number of letters accepted by the user comprises a most likely sequence of letters for each letter corresponding to the number within the entered key input immediately after the part of the entered key input corresponding to the number of letters accepted by the user.

11. (original) The method of claim 10, wherein the most likely sequence of letters for each letter

corresponding to the number within the entered key input immediately after the part of the entered key input corresponding to the number of letters accepted by the user is determined by using a letter language model.

12. (original) The method of claim 11, wherein using the letter language model comprises using an n-gram letter model.

13. (original) The method of claim 1, wherein determining the one or more sequences of letters comprises using a letter language model.

14. (original) The method of claim 13, wherein using the letter language model comprises using an n-gram model.

15. (original) The method of claim 1, further comprising receiving the entered key input.

16. (original) The method of claim 1, further comprising:

determining a word corresponding to the entered key input as the intended word;
determining whether the word determined is in a dictionary of words; and
ending the method in response to determining that the word determined is in the dictionary of words.

17. (original) The method of claim 1, wherein the method is performed by execution of a computer program by a processor from a computer-readable medium.

18. (currently amended) A computer-readable medium having instructions stored thereon for execution by a processor to perform a method for selecting an intended word entered using a reduced keypad, where each of one or more keys of the reduced keypad is mapped to a plurality of letters, the method comprising:

repeating, for an entered key input, a user having accepted a number of letters of the intended word, the number equal to zero or more and less than a number of letters of the intended word, determining one or more sequences of letters as the intended word consistent with the entered key input and the number of letters accepted by the user;

presenting the one or more sequences of letters as the intended word to the user; and

receiving indication that an additional one of the letters of the intended word has been accepted by the user, such that the number of letters of the intended word accepted is increased by one, until indication has been received that the user has selected one of the one or more sequences of letters presented as the intended word.

19. (original) The medium of claim 18, wherein the reduced keypad is a numeric keypad.

20. (original) The medium of claim 18, where the sequences of letters each corresponds to one of a word not listed in a predetermined dictionary and a pseudo-word.

21. (original) The medium of claim 18, wherein the one or more sequences of letters comprises at least one sequence of letters for each letter corresponding to a number within the entered key input immediately after a part of the entered key input corresponding to the number of letters accepted by the user.

22. (original) The medium of claim 21, wherein the at least one sequence of letters for each letter corresponding to the number within the entered key input immediately after the part of the entered key input corresponding to the number of letters accepted by the user comprises a most likely sequence of letters for each letter corresponding to the number within the entered key input immediately after the part of the entered key input corresponding to the number of letters accepted by the user.

23. (original) The medium of claim 18, wherein the one or more sequences of letters is determined by using a letter language model.

24. (original) The medium of claim 23, wherein using the letter language model comprises using an n-gram letter model.

25. (original) The medium of claim 18, the method further comprising receiving the entered key input.

26. (original) The medium of claim 18, the method further comprising:

- determining a word corresponding to the entered key input as the intended word;
- determining whether the word determined is in a dictionary of words; and,
- ending the method in response to determining that the word determined is in the dictionary of words.

27. (currently amended) A method for selecting a word entered using a reduced keypad, where each of one or more keys of the reduced keypad is mapped to a plurality of letters, the method comprising:

- receiving key input corresponding to the word, the key input having a left context;
- for each word in a vocabulary that is consistent with the key input, determining a probability of the word given the left context, and adding the word and the probability of the word to an array of word-probability pairs;
- finding one or more potential words from a dictionary of words, where each potential word has a cost between the entered key input and a sequence corresponding to the potential word less than a maximum cost;
- determining a probability of each potential word given the left context and taking into account a probability that each letter of the potential word is misspelled, and adding the potential word and the probability of the word to the array;

determining one or more sequences of letters consistent with the entered key input and a number of letters accepted by a user, the number equal to zero or more, the one or more sequences of letters including at least one sequence of letters for each letter corresponding to a number within the entered key input immediately after a part of the entered key input corresponding to the number of letters accepted by the user;

determining a probability of each sequence of letters taking into account an out-of-vocabulary penalty and a first occurrence bonus, and adding the sequence of letters and the probability of the sequence of letters to the array;

sorting the array of word-probability pairs in decreasing order of probability; and

presenting a first number of words from the array of word-probability pairs to the user, where the user selects the word corresponding to the entered key input from the first number of words presented and where the user can indicate additional letters have been accepted to increase the number of letters accepted by the user, wherein the number of letters accepted is less than a number of letters in the word, and to cause redetermination of the one or more sequences of letters.

28. (original) The method of claim 27, wherein the reduced keypad is a numeric keypad.

29. (original) The method of claim 27, further initially comprising, for each word in a cache that is consistent with the key input, determining a probability of the word given the left context, and adding the word and the probability of the word to an array of word-probability pairs.

30. (original) The method of claim 27, further comprising:

for each word in the vocabulary that is consistent with the key input as an initial part of the word, determining a probability of the word given the left context, and, upon determining that the probability is greater than a greatest probability so far determined, setting the greatest probability to the probability and a greatest probability word associated with the greatest probability to the word;

upon determining that the greatest probability is at least a number of times greater than a word of a first word-probability pair of the array of word probability-pairs, adding the greatest probability word associated with the greatest probability and the greatest probability a new first word-probability pair to the array.

31. (original) The method of claim 27, further comprising:

finding one or more additional potential words from the dictionary, where each additional potential word has a cost between the entered key input and a prefix of a sequence corresponding to the potential word less than a maximum cost;
determining a probability of each potential additional word given the left context and taking into account a partial word penalty, and upon determining that the probability is greater than the greatest probability so far determined, setting the greatest probability to the probability of the potential additional word and the greatest probability word associated with the greatest probability to the potential additional word.

32. (original) The method of claim 27, wherein the one or more sequences of letters are determined by using a letter language model.

33. (original) The method of claim 31, wherein using the letter language model comprises using an n-gram letter model.

34. (original) The method of claim 27, wherein the method is performed by execution of a computer program by a processor from a computer-readable medium.

35. (currently amended) An apparatus comprising:

a plurality of keys of a reduced keypad, each of one or more of the keys mapped to a plurality of letters, the plurality of keys used to enter key input corresponding to a

word using a single-tap approach in which one of the keys is pressed only once for each letter, the key input having at least one of a left context and a right context; and,

a word-determining logic designed to determine one or more sequences of letters as the word and to present the one or more sequences of letters, where a user selects the word corresponding to the key input from the one or more sequences of letters without resorting to a multiple-tap approach in which one of the keys is pressed at least once for each letter, and where the user can indicate without resorting to the multiple-tap approach an accepted one or more initial letters of the word from the one or more sequences, the one or more initial letters having less letters than the word, to cause redetermination of the one or more sequences of letters presented.

36. (original) The apparatus of claim 35, wherein the reduced keypad is a numeric keypad.

37. (original) The apparatus of claim 35, further comprising a spell-checking logic designed to provide potential alternative words for the word corresponding to the key input entered, where the word is misspelled, taking into account that the word was entered using the plurality of keys, as opposed to a keyboard having a unique key for each of the plurality of letters.

38. (original) The apparatus of claim 37, wherein the spell-checking logic is further to determine one or more potential words to the word where the word is not found in a dictionary of words, by at least finding the one or more potential words from the dictionary, each potential word having a cost between the key input and a sequence corresponding to the potential word less than a maximum cost.

39. (original) The apparatus of claim 35, wherein the word-determining logic is further designed to determine the word corresponding to the key input by using a machine learning approach based on one or more of the at least one of the left context and the right context of the key input.

40. (original) The apparatus of claim 39, wherein the spell-checking logic is part of the word-determining logic.

41. (original) The apparatus of claim 35, wherein the apparatus is a telephone.

42. (original) The apparatus of claim 41, wherein the apparatus is a mobile telephone.

43. (original) The apparatus of claim 41, wherein the apparatus is one of: a cellular telephone, a corded telephone, a cordless telephone, a digital telephone, and a radio telephone.

44. (original) The apparatus of claim 35, wherein the apparatus is one of: a pager, a desktop computer, a laptop computer, a handheld device, a personal-digital assistance (PDA) device, and a remote control device.

45. (original) The apparatus of claim 35, wherein the word-determining logic comprises a computer program stored on a computer-readable medium for execution by a processor.

REMARKS

This communication is in response to the Office Action mailed on June 30, 2006. In the Office Action, claims 1-45 were pending.

On page 2 of the Office Action, claims 1-45 were rejected under 35 U.S.C. 102(e) as being anticipated by Savolainen (U.S. Pub. No. 2002/0126097). Of these claims, claims 1, 18, 27 and 35 are independent. These claims have been amended to clarify selection of initial letters for a word. As discussed below, subject matter disclosed in the present application relates to selecting an initial sequence of letters without resorting to a multiple-tap approach. This situation is especially useful when the intended word does not appear in the list or when the intended word is not in the vocabulary, or dictionary, being used. For example, if the present invention is used in conjunction with a standard telephone keypad and the user presses the number 6 as the first key in the input sequence, the user may have intended either "M", "N", or "O". If the intended word does not appear in the list of possible words, the user may specify the first letter of the sequence as being one of "M", "N", or "O" without resorting to a multiple-tap approach. In this manner, the list of possible intended words would be redetermined using the same sequence of input keys having the user selected letter as the first letter in the sequence. As a result, a more user-friendly approach to entry of words using a reduced keypad is realized.

Savolainen describes a method for entering alpha numeric data. In particular, Savolainen discloses a method of entering text using a reduced keyboard. Vocabulary modules are used to associate a list of possible text outputs given a keyboard sequence inputted by the user. The list contains objects in the vocabulary which match the entered keyboard sequence and are listed in a selection list according to the frequency of use. To specify individual letters in the sequence, which is especially important in cases in which the intended word is not in the vocabulary modules or related dictionaries, the user uses a multiple-tap (multi-stroke) method in which the key is pressed at least once for the intended letter (see FIG. 10, S113). Thus, Savolainen teaches away from selection of individual letters without using a multiple-tap approach.

Independent claim 1 recites a method for selecting an intended word entered using a reduced keypad. Each of one or more of keys of the reduced keypad is mapped to a plurality of

letters. For an entered key input using a single-tap approach in which one of the keys is pressed only once for each letter, the method includes determining one or more sequences of letters as intended word based on a score for each of the one or more sequences of letters. The one or more sequences of letters are presented as the intended word. A user selects the intended word from the one or more sequences of letters without resorting to a multiple-tap approach in which one of the keys is pressed at least once for each letter. The user can indicate without resorting to the multiple-tap approach an accepted one or more initial letters of the intended word from the one or more sequences of letters. The one or more initial letters has less letters than the intended word. Redetermination of the one or more sequences of letters is presented as the intended word.

In contrast, Savolainen does not enable the user to accept one or more initial letters of an intended word without using a multiple-tap approach in which the initial letters have less letters than the intended word. In FIG. 3 and its associated description, Savolainen describes traversing through a list of possible words in a dictionary dependent on user input. The list is presented after a user has input a sequence and pressed the select key. Savolainen further describes that a multiple-tap method is used to unambiguously specify each letter for words that are not in the vocabulary modules (Paragraphs 29 and 86 and FIG. 10). Step S113 describes that a method other than the multiple-tap can be used, but does not teach or suggest selection of a particular letter or a sequence of letters. The Office Action points to paragraph 64 of Savolainen to describe selecting initial letters of a word. However, this paragraph deals with selecting an entire word (an entry in the selection list) and not one or more initial letters. If the user presses the select key, the selection list is traversed until the select key is not pressed. Then, the current entry is used as the word. Furthermore, there is simply no teaching or suggestion of selecting initial letters less than a number of letters in the intended word. For at least these reasons, Applicants respectfully submit that the method of claim 1 is neither taught nor suggested by Savolainen and is in allowable form.

Independent claim 18 recites a method for selecting an intended word entered using a reduced keypad in which the user, for an entered key input, accepts letters of the intended word. A number of accepted letters is less than a number of letters for the intended word. Sequences of letters are determined as possible intended words consistent with the entered key input and the

letters accepted by the user. The accepting of a letter increases the accepted letters by one and is repeated until the user selects one of the sequences of letter presented as the intended word.

In the rejection of claim 18, the Office Action cites Savolainen (figure 3, item S1 and paragraph 44) as showing an element wherein the user accepts a number of letters of the intended word. Applicants respectfully submit that Savolainen does not describe a method of accepting a number of letters of an intended word, but instead accepts an intended word from a vocabulary. Paragraph 44 of Savolainen describes the operation of a reduced keyboard system in which the system receives a keystroke input from the keyboard and subsequently adds the keystroke to the keystroke sequence. Subsequently, objects in a vocabulary are identified that correspond to the current keystroke sequence. In this manner, the user, by entering a keystroke, is not accepting a letter of the intended word but is instead adding an ambiguous keystroke to the sequence. The sequence is then referenced to a vocabulary of words, rather than signifying a selection of one or more letters. In the features of claim 18, a method of allowing users to specifically accept one or more letters in the keystroke sequence and subsequently redetermining the list of possible intended words allows the list to be narrowed based on selected letters and therefore contain possibilities that may not be in a dictionary. Thus, applicants respectfully submit that the method of claim 18 is neither taught nor suggested by Savolainen and is in allowable form.

Independent claim 27 recites a method for selecting a word entered using a reduced keypad including determining one or more sequences of letters consistent with the entered key input and a numbers of letters accepted by a user. The method further allows the user to accept additional letters less than a number in an intended word, thus causing the list of possible intended words to be redetermined. For example, if the user accepts three letters of the intended word and the redetermined list does not include the intended word, the user may accept one or more letters to cause redetermination of the list. Subsequently, the intended word is more likely to appear in the redetermined list. The list is determined based on a probability that the word is misspelled and taking into account an out-of-vocabulary penalty and a first occurrence bonus.

In the rejection of claim 27, the Office Action cites Savolainen (paragraphs 83 and 90) as showing an element wherein one or more sequences of letters are determined consistent with the

entered key input and a number of letters accepted by the user. As discussed above, applicants respectfully submit that Savolainen does not describe enabling the user to accept a number of letters less than a number of letters in a word such that the sequences of letters determined as possible intended words are consistent with the accepted letters. The Office Action further cites paragraph 73 and 74 to describe an out-of-vocabulary penalty and a first occurrence bonus. However, these paragraphs simply describe adding a word or words to a dictionary and does not take into account a penalty or a bonus depending on the sequence of letters. There is simply no evidence in Slovenian to support a first occurrence bonus or out-of-vocabulary penalty used as recited in claim 27. Thus, applicants respectfully submit that claim 27 is neither taught nor suggest by Savolainen.

Independent claim 35 recites an apparatus comprising a reduced keypad having a plurality of keys used to enter a key input corresponding to a word and word-determining logic designed to determine one or more sequences of letters as the word. The user can accept one or more initial letters of the word, the one or more letters having less letters than the word, to cause redetermination of the sequences of letters presented without resorting to the multiple-tap approach. Applicants note that, as mentioned above with respect to claim 1, Savolainen neither teaches nor suggests allowing the user to accept one or more initial letters of the entered key input. Applicants respectfully submit that claim 35 is in allowable form.

In addition, Applicants further submit that many of the dependent claims are independently patentable. For example, claim 3 presents a sequence of letters not in a dictionary. The Office Action cites sections that correspond to formatting a word in a dictionary (didn't to didn't) and adding a word in a dictionary, but does not present a sequence not in a predetermined dictionary. Additionally, claim 21 requires that the one or more sequences of letters determined as the intended word comprises at least one sequence of letters for each letter corresponding to a number within the entered key input immediately after a part of the entered key input accepted by the user. This aspect of the present invention is shown on page 18, line 13 through page 19, line 12. Simply put, this ensures that the user is able to select the next letter of the intended word as each letter corresponding to next keystroke in the input sequence is represented in at least one word in the list of possible intended words.

In view of the foregoing, Applicants respectfully submits that claims 1-45 are not taught nor suggested by Savolainen and are in allowable form. Reconsideration and allowance of claims 1-45 are respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

WESTMAN, CHAMPLIN & KELLY, P.A.

By: 

Todd R. Fronek, Reg. No. 48,516

Suite 1400

900 Second Avenue South

Minneapolis, Minnesota 55402-3319

Phone: (612) 334-3222 Fax: (612) 334-3312